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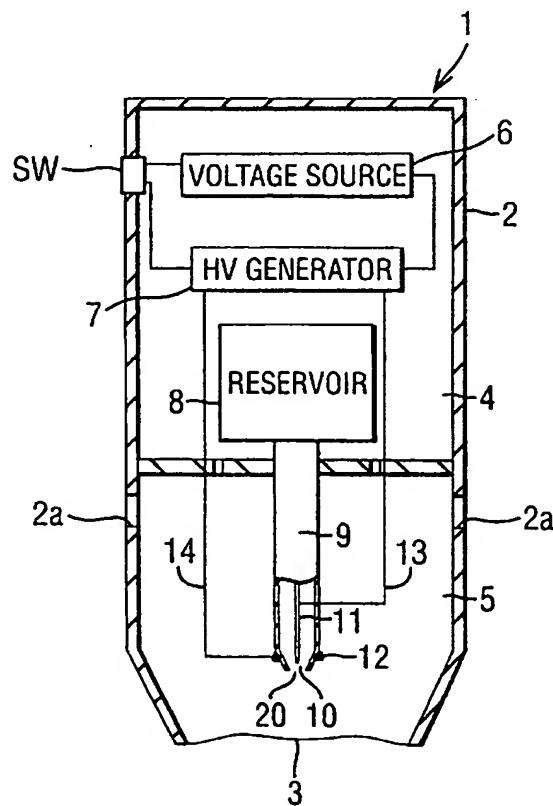
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[Continued on next page]

(54) Title: DISPENSING DEVICES AND LIQUID FORMULATIONS



(57) Abstract: Methods are described of delivering biological material, which methods include the steps of providing a liquid formulation containing the biological material, supplying the liquid formulation to an outlet and subjecting liquid issuing from the outlet to an electrical field thereby causing electrohydrodynamic processing of the liquid without denaturing the biological material. In one example, the liquid formulation is provided by removing salts from a formulation containing biological material that does not denature in alcohol and then adding an alcohol to the formulation before supplying the liquid formulation to the outlet. An acid may be added to the liquid formulation before supplying the liquid formulation to the outlet.

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LR. LS. LT. LU. LV. MA. MD. MG. MK. MN. MW. MX.  
MZ. NO. NZ. PL. PT. RO. RU. SD. SE. SG. SI. SK. SL.  
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**INTERNATIONAL SEARCH REPORT**

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**A. CLASSIFICATION OF SUBJECT MATTER**  
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According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, BIOSIS

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 49923 A (RENNIE PAUL JOHN ;PROCTER & GAMBLE (US)) 7 October 1999 (1999-10-07)  page 3, line 25 - line 29 page 4, line 29 page 6, line 1 - line 32 page 6, line 24 page 7, line 9 - line 13 ---	1,2, 7-21, 32-40, 53-56, 58
A		41,57 -/-

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Patent family members are listed in annex.

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PCT/GB 01/01529

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 03267 A (ELECTROSOLS LTD ;COFFEE RONALD ALAN (GB)) 29 January 1998 (1998-01-29) cited in the application  page 2, line 23 - line 26 page 4, paragraph 3 -page 5, line 1 page 12, line 31 -page 13, line 1 page 18, last paragraph -page 19, paragraph 1 page 22, paragraph 2 -page 23, paragraph 1 page 24, line 18 - line 24 page 29, paragraph 1 page 5, paragraph 3 -page 6, paragraph 1 figure 1 ---	1,2,8, 10-16, 19-21, 52,53, 55,58
X	GB 2 273 893 A (UNILEVER PLC) 6 July 1994 (1994-07-06)  page 7, paragraph 1 page 12, paragraph 2 page 13, line 11 - line 12 page 13, line 32 - line 33 page 14, line 17 - line 33 page 15, paragraph 3 page 25, line 17 -page 26, line 2 ---	1,2, 7-19,21, 32-38, 40,42, 52-55,58
X	EP 0 919 242 A (LILLY CO ELI) 2 June 1999 (1999-06-02)  page 6, line 19 paragraphs '0037!, '0039!, '0040! ---	1,2, 7-19,21, 32-38, 42,52-54
X	US 5 873 523 A (DE LA MORA JUAN FERNANDEZ ET AL) 23 February 1999 (1999-02-23)	1,2,19, 21,58
A	column 12, line 12 - line 15	3
A	column 12, line 34 - line 38 ---	
A	WO 89 07603 A (MEMORIAL BLOOD CENTER OF MINNE) 24 August 1989 (1989-08-24) page 13, paragraph 2 - paragraph 3 ---	3,22,28
A	WO 96 30068 A (ARADIGM CORP) 3 October 1996 (1996-10-03) page 15, line 25 - line 29 ---	41,57
A	WO 94 12285 A (ELECTROSOLS LTD ;COFFEE RONALD ALAN (GB)) 9 June 1994 (1994-06-09) page 5, line 22 - line 34 ---	55,56
		-/-

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 01/01529

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 00 35524 A (PIRRIE ALASTAIR BRUCE ;DAVIES NEVILLE (GB); ELECTROSOLS LTD (GB);) 22 June 2000 (2000-06-22) cited in the application page 42, line 26 - line 28 page 43, line 24 -page 49, line 27 figure 2	1,2,8, 10-16, 19-21,58
P,A	-----	7,32,33
P,X	WO 00 66206 A (BATTELLE MEMORIAL INSTITUTE) 9 November 2000 (2000-11-09)  the whole document -----	1,2, 7-21, 32-40, 42,52-56

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No  
PCT/GB 01/01529

Patent document cited in search report	Publication date		Patent family member(s)		Publication date
WO 9412285	A	ZA	9308895 A		31-03-1995
WO 0035524	A	22-06-2000	GB 2345010 A		28-06-2000
			AU 1872500 A		03-07-2000
			EP 1140262 A2		10-10-2001
			WO 0035524 A2		22-06-2000
WO 0066206	A	09-11-2000	AU 4979700 A		17-11-2000
			EP 1173245 A2		23-01-2002
			WO 0066206 A2		09-11-2000